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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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GAS ABSTRACTS

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1. GAS INDUSTRY

Financing

Olson, H. E. HOW A UTILITY COMPANY RAISED COMMON STOCK CAPITAL. *Public Utilities Fortnightly* **44**, 777-784 (1949) *December* 8.

The plan by which the Columbia Gas System raised $21,655,000 from the sale of common stock during a period of nine months is described in detail. The discussion of the important features of this successful plan may be of interest to other companies faced with financing problems.

J. C. Lane

Natural Gas vs. Other Fuels

Dotterweich, F. H. POSITION OF NATURAL GAS VERSUS OTHER ENERGY SOURCES. *Gas Age* **104**, 30-33, 76, 78 (1949) *December* 8.

Natural gas commands an ever-increasing position of importance in the nation's fuel picture. Comparative price statistics over the last decade show that natural gas prices have remained stable while the prices of coal and fuel oil have increased markedly. Increases in the price of coal combined with the increasing availability of natural gas have resulted in an 18-fold rise in natural gas utilization since 1900 while coal usage has only doubled. The substantial continuous increase in proved gas reserves indicates that it can continue as a highly competitive fuel for many years to come. While atomic energy may become a competitor in the future fuel picture, its usage on a substantial scale will probably not occur in less than 30 years. If and when it does, present price trends indicate that natural gas will be the last of the present major fuels to feel the effects of its competition. Since natural gas and petroleum are closely associated from production through end uses, the research and technologic advances of the one usually benefits the other also. Active programs of research are currently being prosecuted by both the natural gas and petroleum industries. The manufactured gas industry's research has important effects on the natural gas industry, particularly as regards the problem of peak load. However, greater efficiencies in gas production are not expected to alter the constantly growing preference for natural gas, since the price of manufactured gas is irrevocably influenced by the cost of its major raw materials, coal and petroleum.

J. C. Lane

Poe, E. H. NATURAL GAS ENTERS PETROLEUM'S PRIME MARKETS. *Petroleum Refiner* **28**, 75, 78, 80 (1949) *December*.

The appeal of stability of service, flexibility and efficient utilization has made natural gas accepted in any area into which it has been introduced. The widespread introduction of natural gas into new areas foreshadows a decreasing demand for heating oils and a probable change in refinery operations to reduce the production of these oils. Natural gas expansion will continue, and this fuel will continue to make inroads on coal and oil demand. Residual oil demand probably will not be greatly affected since gas is presumably too superior a fuel to be employed extensively for electrical power generation or low-priced boiler fuel. Quantities of oil will be required for high-Btu oil gas plants for peak shaving and even for base load in some areas. A fuel revolution is under way, but the oil industry is capable of meeting it by shifts in production.

J. C. Lane

Taylor, E. NATURAL GAS IN NEW PASTURES. *Am. Gas J.* **171**, 10-16 (1949) *November*.

Natural gas will become available to the most concentrated fuel market in the world, eastern Pennsylvania, New York and New Jersey, within a year. Shortly thereafter it is probable that Connecticut, Massachusetts and Rhode Island will begin to receive natural gas. How the utilities will employ these new supplies will depend upon individual local situations. To determine the probable utilization of natural gas by major eastern gas companies, the American Gas Journal has made a study of various local situations and has reported the results in this article. The number of customers, annual gas sales and heating values of the gases currently distributed are given for each of the major companies affected, together with a description of the contemplated changes in operation and distri-

bution resulting from the availability of new sources of natural gas.

J. C. Lane

WHAT NATURAL GAS IS DOING TO LP-MEN. *LP-Gas* **9**, 35, 49 (1949) *December.*

LP-gas distributors are losing business to natural gas wherever it becomes available. The price differential between these fuels does not make competition possible. By going beyond the natural gas mains, the LP-gas dealers can offset, at least partially, their loss of customers.

J. C. Lane

Regulation

Coates, F. G. DEVELOPMENTS IN THE FIELD OF ELECTRIC AND GAS UTILITIES. *Public Utilities Fortnightly* **44**, 678-681 (1949) November 10.

The more important legal decisions reached in 1949 which affect electric and gas utilities were concerned almost entirely with regulation, no significant decisions on taxation having been made. The Supreme Court ruled that Panhandle Eastern Transmission Company's transfer of undeveloped gas leases did not come under Federal Power Commission regulatory powers. The court of appeals held that East Ohio Gas Company which transmits and distributes natural gas wholly within Ohio was not subject to FPC regulation. Other decisions worthy of mention are: the Border Pipe Line Company case, which held that a FPC certificate of public convenience and necessity is not required for the construction of facilities to transport natural gas from a point in Texas into Mexico; the Montana-Dakota Utilities Company case which held that a company which has constructed pipe lines across public lands has accepted the classification of a common carrier and is subject to the regulations applying to interstate commerce transmission; and two cases in which pipe line companies were required to show firm contracts for gas supply for the full period of their proposed gas sales contracts.

J. C. Lane

Sales Promotion

Cuthrell, H. H. SCANNING THE PLANNING FOR SALES. *Am. Gas Assoc. Monthly* **31**, 23-24, 52-53 (1949) *November.*

Integration of local promotion with the national programs financed by PAR funds requires year-around planning but guarantees optimum impact on the consumer. The periods of the major PAR promotional campaigns scheduled for 1950 are as follows: water heaters and clothes driers, February and March; ranges, April, May and June with the Old Stove Roundup in September, October and November; house heating and air conditioning, July, August and September; refrigerators, July, August, and September. Four great opportunities and challenges are presented to the gas industry. First, technological changes in production, distribution and utilization can make gas more economical to the consumer and can reduce the appliance manufacturer's problems, one outstanding opportunity being the standardization of Btu content. Second, public relations dramatically emphasizing gas industry expansion can increase the consumer's desire for gas appliances. Third, financing problems can be minimized by cooperation between the industry and regulatory bodies to provide appealing equity securities. Fourth, market studies are required to permit planning for both gas sales and gas appliance sales. The trend toward slower growth of cities and corresponding rapid growth of suburban areas indicates the necessity for appraising the prospects of new markets.

J. C. Lane

2. APPLIANCES

Burners

Zollikofer, H. DEVELOPMENT OF BURNERS FOR DOMESTIC GAS APPLIANCES. (In French) Paper presented at the 4th International Gas Conference, London, 1949.

Flash back on an atmospheric burner cannot occur if (1) the orifice delivers the gas in a diffuse full cone rather than a straight cylindrical jet, (2) the orifice and venturi have a common axis so that the conical gas stream fills the entire cross section of the venturi throat, and (3) the size of the orifice and the cross section of the venturi throat are properly selected for the required burner capacity. It is the practice in Switzerland to adjust the burner so as to obtain 40% gas and 60% air in the primary mixture. This mixture is richer than the upper limit of inflammability, 34% gas. Thus, this method of preventing flash back requires that the burner head be supplied with a non-flammable primary mixture and that the mixture be uniform, showing no variations in composition over the cross section of the mixing tube. Noisy extinction is encountered when the port diameter exceeds the port depth.

A. J. Rudnitzki

Fuel Igniter

Cohn, J. G. (assigned to Baker & Co., Inc.) METHOD OF IGNITING ORGANIC FUELS. U.S. 2,487,752 (1949) November 8.

Two claims were allowed for the application of very fine platinum wire as a catalytic igniter which can be substituted for any pilot light where a flash tube ignition system is employed. The wire is electrically heated to increase activity of the catalyst. See the following abstract for further details.

E. F. Davis

Cohn, J. G. (assigned to Baker & Co., Inc.) FUEL IGNITER. U.S. 2,487,753 (1949) November 8.

Eight claims were allowed for a heterophase catalytic igniter which can be employed with flash tube designs. Specially shaped platinum or platinum alloy wire having a diameter between 0.003 in. and 0.001 in. is electrically heated to about 400°C and located at the end of the flash tube. The wire is separated into two zones each having a different degree of catalytic activity. When passing a methane-air mixture over the wire the first zone burns the mixture in flameless combustion, thereby heating the second zone causing enough activity to give flame combustion. The flame then flashes back through the flash tube and ignites the burner in the normal fashion. The time required to produce flash back when employing methane is one second. The electrical energy consumption is about two watts. A considerable amount of technical information about catalytic ignition is divulged in this patent.

E. F. Davis

Cohn, J. G. (assigned to Baker & Co., Inc.) FUEL IGNITER. U.S. 2,487,758 (1949) November 8.

Two claims were allowed for the application of the above mentioned catalytic igniter to a multiburner flash tube igniter similar to gas range top burner lighters.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Combustion

Arthur, J. R. RECENT RESEARCHES ON THE COMBUSTION AND GASIFICATION OF BEDS OF SOLID FUELS. *Bull. Brit. Coal Utilization Research Assoc.* 13, 297-304 (1949) *September.*

Significant research work in the period 1944-1948 is reviewed. Studies of combustion on simulated travelling-grate stokers by Carman and Reid indicated decrease in ignition rates with increased moisture and ash in the fuel, an increase to a maximum ignition rate with increased air rate and particle size; and a linear increase of ignition with increasing preheat of primary air. Marskell's "sectional fuel bed" studies on similar type grates showed that increased air rates, ash content, and bed thickness lowered the grate temperature. Crone in a similar work showed that the emission of

deposit-forming materials from the fuel bed occurred while the combustion was of a two-stage character, but disappeared when "equilibrium burning" was attained. In gasification research Foster and Vorum's results on a pilot water-gas generator indicated a stoichiometric unbalance. These and other workers' results can be partially explained by work of Arthur, Bangham and Thring upon kinetics of oxygen reactions in the fuel bed. Here the powerful effect of water or hydrogen as chain carriers in the gas phase combustion of carbon monoxide was determined by addition of P or Cl compounds as inhibitors. This work and that of others upon mechanism of carbon combustion at low and ordinary oxygen pressures has required revision of earlier theories of solid fuel combustion. The kinetics of the CO_2/C and H_2O/C reactions have been clarified by recent reports of the Gas Research Board, but further work is needed upon the water-gas reaction to establish its true mechanism.

O. P. Brysch

Godsave, G. A. E. COMBUSTION OF DROPLETS IN A FUEL SPRAY. *Nature* (British) **164**, 708-709 (1949) *October* 22.

The burning rate of liquid-fuel droplets, ranging in size from 1,000 to 200 microns, is proportional to the first power of their radii. It further depends on the rate of heat flow to the droplet and on the heat required for evaporation but is independent of the vapor pressure of the burning drop. An expression for the burning rate, in terms of the geometry and the physical properties of the system, yields calculated values in close agreement with the observed rates. This preliminary note summarizes the results which are to be fully reported elsewhere.

A. J. Rudnitzki

PIONEERING WORK ON SOLID FUEL COMBUSTION. *Brit. Coal Util. Research Assoc. Quarterly Gazette* 1949, 87, 90-92.

Since 1940 the BCURA has devoted its studies to the elucidation of the mechanism of the energy release in and over fuel beds in active combustion. Convincing evidence has been found that even with highly devolatilized fuels *most of the energy release occurs in the gas phase* remote from the carbon surface, and that this is the second stage of a two stage combustion process. Addition of inhibitors to the oxygen stream has shown that carbon monoxide is the primary and practically the only product of high temperature combustion of carbon. The inhibitors destroy the hydrogen atoms (from traces of moisture, hydrocarbons) which act as promoters or chain-initiators in the rapid combustion of CO in the gas phase, and thus produce greater consumption of oxygen at the carbon surface (or an increased gasification). The surface so affected includes the internal pore surface of any fuel, so that gasification (combustion) of a particle may occur extensively before its shape or dimensions are altered.

O. P. Brysch

Furnaces

Waight, J. F. THE PRODUCTION AND EMPLOYMENT OF PRODUCTS OF COMBUSTION IN SMALL HIGH TEMPERATURE GAS FURNACES. *Gas World* (British) *"Supplement"* **130**, 129-138 (1949) *November* 19.

This paper has been written to indicate some of the fundamental considerations which apply to the design of pressure air burners used in continuous tube heating furnaces, and also to indicate how heat transfer in a small enclosure seems to depend on the characteristics of the burner. It is stated that the burner should be designed to give a maximum velocity at the port in order to obtain a maximum velocity in the furnace because the efficiency of the system depends primarily on this velocity and secondarily on the emissivities of the furnace wall and the tube being heated. An empirical equation for calculating the rate of heat transfer is given.

E. F. Davis

Gas Turbine Plant

GAS TURBINE PERFORMANCE REPORTED BY OKLAHOMA GAS AND ELECTRIC. *Southern Power & Ind.* 67, 54-56 (1949) *December.*

The first central station gas turbine plant to be put into service in the United States has ex-

ceeded its design capacity of 3500 kw by approximately 14% during short periods in four months of operation. The gas turbine is of the simple open cycle type, fired with natural gas, while the waste heat from the exhaust is used to supplement the feed water heating system of an adjacent steam plant. Typical advantages for a gas turbine installation include lower cost housing and foundation requirements, and less space and weight per kw capacity as compared to a steam-electric plant. Costs and operating data are included.

C. Von Fredersdorff

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Cohn, J. G. METHOD OF IGNITING ORGANIC FUELS. p. 3

4. CARBONIZATION AND GASIFICATION

Coal Preparation

Reed, W. PROGRESS REVIEW. PART II. COAL PREPARATION. *J. Inst. Fuel* (British) 22, 365-368 (1949) *October.*

Increase in dirt content and decrease in size of coal mined in recent years has necessitated improvements in coal preparation technique. The author reviews changes in preparation practice which have occurred with respect to: (1) development of the dense-medium process; (2) development of the Baum jig for larger sizes; (3) upgrading of fine coal; and (4) control and testing of preparation plants. Several types of dense-medium and of jig processes are compared. Dewatering, drying, and screening processes are briefly discussed.

O. P. Brysch

Coke Oven

Wilputte, L. and Wethly, F. (assigned to Allied Chemical & Dye Corp.) COKE OVEN BATTERY AND OPERATION THEREOF. U.S. 2,488,952 (1949) November 22.

The inventors space the several charging holes of a coke oven so that the volume of the oven chamber to be filled from each hole is divided into substantially equal sections, thereby compensating for the taper of the chamber from one end to the other. Substantially equal portions of the coal charge are force-fed (by controlled feeding with a rotating plate or a vibrating pan) from each larry-tank into the charging hole which is undercut to form a flared space which helps to avoid blockage of gas flow by the piled-up coal. Subsequent levelling of the top surface of the coal charge thus requires less bulldozing, shorter charging time, and gives less smoke. With a dry coal, the rapid initial gas evolution is dissipated by connecting each end of the freshly-charged chamber to a separate collecting main from which the gas may pass into adjacent oven chambers which are well-advanced in carbonization and have lower gas pressures. This flow is said to eliminate the deposition of roof-carbon and the dangers of cross leakage of higher pressure rich gas into the heating flues.

O. P. Brysch

Wilputte, L. and Wethly, F. (assigned to Allied Chemical & Dye Corp.) COKE OVEN BATTERY FOR COKING WET COAL AND OPERATION THEREOF. U.S. 2,488,953 (1949) November 22.

This patent is similar to and contains the generic claims of U.S. 2,488,952. However, it applies only to charging of wet coal (above 5% moisture) and to using one gas collecting main.

O. P. Brysch

Corrosion

Rhodes, E. O. CORROSION IN THE GAS PLANT: ITS CAUSES AND PREVENTION. *Gas* 25, 32-37 (1949) *December.*

Using the modern byproduct coke plant as an illustration, the corrosion problems of gas plants are discussed in some detail, from the unloading of the coal to the specialized purification of the products. Corrosive agents, materials of construction and protection of iron and steel structures throughout the plant are treated. Special methods of combatting corrosion at coke quenchers, liquor coolers, and ammonia saturators are discussed. Use of alloy steels, and the use of suitable bituminous and non-bituminous coatings are treated briefly.

O. P. Brysch

Downjet Furnace

Ross, F. F. and Sharpe, G. C. H. THE COKE-FIRED DOWNJET FURNACE. *Coke & Gas* (British) **11**, 389-394 (1949) *November.*

This article is the first description in technical journals of the principles and application of the coke-fired Downjet furnace. Coke, fed by gravity from a supply hopper, slides down a sloped front-wall and forms a bed with a surface sloped at an angle of repose depending upon the particle size. Against this slope air is blown at 100-200 ft per sec. through a refractory jet so that a shallow penetration of the bed is achieved, and so that the combustion gases make exit from the same sloped surface of the bed a short distance away. This "glancing penetration" restrains the escape of carbon monoxide from the bed which would require large gas-phase combustion space and excess air and thereby obtain a heat release of 500,000 Btu per cu ft per hr in a small furnace volume. Control of burning rate and air/fuel ratio are achieved by controlling the air only. Ignition of a cold bed is obtained by a petrol torch flame. Ash is removed in the form of a lens-shaped clinker resulting from coalescence of slag droplets below the incandescent zone. The clinker is lowered mechanically at intervals by sliding it horizontally into a quenching pit. "Furnace" coke of $1\frac{1}{2}$ inch size with 30% added coke breeze has been burned successfully. This furnace has been applied successfully to steam generation, high temperature refractory testing, billet heating, and low-temperature drying of foundry molds.

O. P. Brysch

Dry Coke Cooling

Foxwell, G. E. DRY COKE COOLING. *J. Inst. Fuel* (British) **22**, 346-353 (1949) *October.*

The author discusses dry coke cooling from the basis of four recent British publications, namely those by the Ministry of Fuel & Power, by Savage and Brancker, by Hersche, and by Pearson. Topics emphasized are: general recovery of heat in carbonization practice, recovery of sensible heat in coke, quantity of steam produced by dry cooling, types of dry cooling plants, design, standby plant, quality of coke as to moisture and size, dry-cooled coke in blast-furnace practice, economic considerations as pertaining to (a) integrated iron- and steel-works, (b) colliery coke-oven plants, and (c) gasworks. Capital costs of plant and standby yield and value of steam and breeze, and value of boiler fuel saved by dry coke cooling must be worked out for the individual installation.

O. P. Brysch

Gas Producer

Dietler, H. (assigned to Aktiengesellschaft Brown, Boveri & Cie, Baden, Switzerland). COMBINED GAS PRODUCER AND GAS TURBINE PLANT. U.S. 2,488,969 (1949) November 22.

The plant described consists of a gas producer operating at a high pressure to gasify solid fuel, particularly coal, means being provided for withdrawal of gases from different zones. The producer is connected directly to a multistage gas turbine with interstage heating devices.

W. E. Ball

Sarjant, R. J. GAS PRODUCER RESEARCH. *Brit. Coal Util. Research Assoc. Quarterly Gazette* **1949**, 82-86.

Gas producer research in England prior to the war dealt with improvements in design and practice chiefly in metallurgical works. During the war period the BCURA work dealt with the motor vehicle producers and their fuels, and also with studies of gasification reactions. Of the nine possible reactions between oxygen, steam, and carbon, the most important and rapid reaction at the particle surface is that between carbon and oxygen to form carbon monoxide, and the most important and rapid in the void space between the bed particles is that between carbon monoxide and oxygen to form carbon dioxide. Present BCURA study pertains to attainment of even, homogeneous fuel beds and to pressure operation. Problems in industrial producer operation involving bed depth, gas quality and improved performance in application are being investigated.

O. P. Brysch

Refinery Gas

Walker, R. and Applebee, H. C. UTILIZATION OF REFINERY GAS. *Gas J.* (British) **260**, 353, 357-360 (1949) *November* 9.

Refinery oil gas from the Catarole oil cracking process became available to the Manchester (England) Gas Department at the Partington works early in 1949. The intention is to use blue water gas to dilute the refinery oil gas before blending with coke oven gas, the base gas. However, the water gas plant was not completed and producer gas has been used to dilute the oil gas. Various gas mixtures of 450 Btu heating value and specific gravities ranging from 0.50 to 0.69 were prepared. Gas analyses and combustion properties of these mixtures are presented and the results discussed.

C. H. Riesz

Resin Oxidation

Lee, E. D. and Schefbauer, R. J., Dunn, H. J. (assigned to Interchemical Corp.) OXIDATION OF UTAH COAL-TYPE RESINS. U.S. 2,488,546 (1949) November 22.

The hydrocarbon resins recovered from Utah-type coals (by froth-flotation) are solvent-extracted with petroleum ether or the like, and the extracted, finely divided resins are exposed to oxygen-containing gases while at a temperature of 5 to 15° below the softening point to obtain an oxygen-containing resin of improved hardness, melting point, and viscosity in solvents.

O. P. Brysch

Tonnage Oxygen

Sherwood, P. W. TONNAGE OXYGEN TODAY. *Chem. Eng.* **56**, 97-100 (1949) *December*.

The rapid progress in the development and construction of oxygen plants during the past 15 months has brought the United States to the threshold of low cost high purity tonnage oxygen. Included among the tonnage oxygen plants operating at the present time are a 175 ton/day unit of McCarthy Chemical Company, a 130 ton/day plant erected by Koppers Company and Air Reduction Company and a 24 ton/day generator operated by the U.S Bureau of Mines at Louisiana, Mo. Other oxygen plants under construction range in design capacities of 400 to 2000 tons/day. Cost estimates indicate a probable lower limit of $4.00 to $5.00 per ton of 95-98% purity tonnage oxygen as compared to a cost of $36 to $45 per ton of high purity chemical oxygen produced by classical methods. The rapid development of tonnage oxygen has been influenced by recent advances in methods of gasification such as: (a) production of synthesis gas by reacting solid and liquid fuels with oxygen and steam; (b) underground gasification of coal using oxygen-enriched air; and (c) manufacture of ethylene and acetylene and other unsaturates by the partial combustion of gaseous hydrocarbons using oxygen. Other applications for tonnage oxygen are possible in the oxygen fired Kerpely gas producer, gasification of pulverized coal in suspension, gasification of solid fuels in a fluidized bed, use of oxygen-enriched blast in the Bessemer converter, the open hearth, and in the blast furnace and in the smelting of sulfide ores in the production of sulfuric acid.

C. Von Fredersdorff

Underground Gasification

Masterman, C. A. BRITAIN TO TRY UNDERGROUND GASIFICATION. *Gas World* (British) **130**, 1940-1942 (1949) *December* 3.

Preliminary experiments to be started in January, 1950 on an open-cast site near Chesterfield, England, if successful may represent a prelude to large scale underground gasification in Great Britain. The work will concentrate on a poorly-workable 18 in. seam partially exposed by previous open cast mining, and will consist of drilling two vertical and one horizontal 4 inch connecting boreholes through which air and steam can be blown and producer gas collected.

C. Von Fredersdorff

COAL GAS BY ELECTRICITY. *Science News Letter* **56**, 245 (1949) *October* 15.

Underground gasification of coal using an electrical current to supply the heat for ignition is being studied in the field near Hume, Missouri, by the University of Missouri, in collaboration with the Sinclair Coal Company. Iron pipes in-

serted from the surface through drill holes into the seam about 20-40 ft apart serve as electrodes. Electrical current passing between these electrodes heats the coal to a temperature high enough to support combustion, coal gas being removed through the pipes. The current is then stopped and air or oxygen is pumped into the coked and porous coal to continue gasification of the coal by partial combustion.

J. C. Lane

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Arthur, J. R. RECENT RESEARCHES ON THE COMBUSTION AND GASIFICATION OF BEDS OF SOLID FUELS. p. 3

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Conservation

FIVE COMPANIES JOIN IN MAJOR COOPERATION CONSERVATION PROGRAM IN THE GOLDEN TREND AREA. *Oil Gas J.* 48, 74-77, 80, 83-84 (1949) *November* 24.

Five companies have joined in a unique project in Oklahoma. The Garvin county plants consist of oil absorption stations at Antioch and Lindsay and a central rich oil processing plant at Maysville, 7½ miles away.

J. D. Parent

Corrosion

Eilerts, C. K., Smith, R. V., Archer, F. G., Burman, L. M., Greene, F. and Hamontre, H. C. FIELD AND LABORATORY TESTS OF SODIUM CHROMATES AND ALKALIES FOR CONTROLLING CORROSION IN GAS CONDENSATE WELLS. PART VI. *World Oil* 129, 160-162, 164, 166, 168 (1949) *December.*

The work reported concludes the tests conducted on the use of sodium chromates and alkalies for controlling corrosion in gas condensate wells. The study of the reduced chromium compounds found as deposits in the well tubing was reported. An estimate of costs for this type of program was given. Several bases for further study of this problem were described.

B. E. Hunt

LP - Gas

Clifford, E. A. PRACTICAL GUIDE TO LP-GAS UTILIZATION. PART IX. METER AND VALVE SIZING. *LP-Gas* 9, 36-37, 40-44, 46 (1949) *December.*

Formulae, charts and nomographs are used to illustrate a simple method for determining proper sizes for gas meters, valves and regulators.

E. F. Davis

Garretson, O. L. (assigned to Phillips Petroleum Co.) LIQUEFIED GAS STORAGE. U.S. 2,488,813 (1949) November 22.

Seven claims were allowed for a method for cooling LP-gas so that it may be stored at low pressure. A separate system is employed to cool the LP-gas when being transferred from tank car or truck.

E. F. Davis

Pipe Lines

Beck, W. THE BEHAVIOR OF BITUMINOUS PIPE COATINGS UNDER BENDING VIBRATIONAL STRESS. *Corrosion* 5, 405-408 (1949) *December.*

Laboratory tests indicate the possibility that low temperatures and vibrations from heavy traffic will adversely affect the life of certain types of bituminous coatings on underground pipes. Reinforced and non-reinforced asphalt coatings and grease impregnated wrappings were applied to steel pipe which was then subjected to low temperatures and bending vibrational stresses. With the exception of the grease impregnated wrapping, all layer systems showed brittle fracture and fatigue.

B. E. Hunt

Joffe, J. STORAGE CAPACITY OF LONG PIPELINES. *Chem. Eng.* 56, 112-113 (1949) *November.*

The Weymouth equation for storage capacity of pipe lines has been rederived taking into con-

sideration the compressibility of the gas and using Kay's proposal that the compressibility factor is determined by the pseudo reduced temperature and pressure. This equation is unlike Miller's where the compressibility factor is assumed constant at a value corresponding to the arithmetic mean pressure. Neither does it assume a constant compressibility factor at the Weymouth mean line pressure, but takes into consideration the actual pressure gradient. Accordingly, it is basically as accurate as the Kay concept, which is widely used in a variety of natural gas problems.

J. D. Parent

Kaestle, F. L. ELECTRIC AND GAS-TURBINE DRIVES FOR OIL AND GAS PIPE LINES. *World Oil* **129**, 204-206, 208, 210-211 (1949) *November.*

The gas turbine has particular application as a pipe line compressor in natural gas transmission, in natural gasoline plants and in locations where: (1) the cost of electricity is high; (2) a saving in space and weight is of advantage; (3) effective use can be made of waste heat; and (4) surplus quantities of low Btu fuel gases are available. The economic limits for the gas turbine probably range from 2000 to 10,000 hp capacity, while for reasons of flexibility, a 5000-7000 hp unit is considered to be the largest practical drive. Several 2000 to 5000 hp gas turbine compressors to be used in natural gas transmission are now in the fabrication stage. The gas turbine is a flexible prime mover which can incorporate any one of several standard operating cycles, operate with or without heat exchangers and drive either single or double compressors at varying speeds. The advantages of electric drives for compressor stations include such factors as (1) operating and maintenance personnel is low, and (2) remote control is possible. For long pipe line spans a logical and practical arrangement of compressors would consist of gas turbine drives at the sending end with electric motor drives at the receiving end.

C. Von Fredersdorff

Kastrop, J. E. MATERIAL CONTROL ON THE TRANSCONTINENTAL GAS PIPE LINE. *World Oil* **129**, 187-190 (1949) *December.*

Accurate control of materials supply now is on a level with purchasing, construction and certain other pipe line activities. Material control on the Transcontinental line by Fish Constructors, Inc. is discussed.

J. D. Parent

Tietze, I. B. CORRELATION BETWEEN CORROSION SURVEY RESULTS AND ACTUAL CONDITIONS AS DETERMINED THROUGH 130 MILES OF CONTINUOUS RECONDITIONING. *Corrosion* **5**, 409-415 (1949) *December.*

An attempt was made to correlate the results of corrosion surveys and actual conditions as determined by the continuous reconditioning of 130 miles of pipe line. Based on this survey, corrosion surveys were found to be accurate to the following extent: (a) by correcting for spot reconditioning and classifying 21% of the length as severe or doubtful, 93% of the corrosion leaks may be predetermined; (b) by disregarding the effect of spot reconditioning and classifying 21% of the length as severe or doubtful, 67% of the leaks may be predetermined and 65% or 50% of the bad pipe (based on 200 and 100 mil pit depth respectively) may be predetermined. Spot reconditioning in accordance with the survey recommendations is not effective for a long period without supplementary cathodic protection.

B. E. Hunt

Production

Beach, F. K. NATURAL GAS FLOW AT SUPERSONIC VELOCITY. *Petroleum Engr.* **21B**, 13-14, 16, 18 (1949) *December.*

The possibility of obtaining supersonic velocity under certain conditions such as in open flow of gas wells is discussed.

J. D. Parent

Billheimer, J. S., Sage, B. H. and Lacey, W. N. MULTIPLE CONDENSED PHASES IN THE N-PENTANE - TETRALIN - BITUMEN SYSTEM. T.P. 2730. *J. Petroleum Technol.* 1, 283-290 (1949) *November.*

The results are presented of an investigation of the phase behavior of the restricted ternary system n-pentane, tetralin, and a purified bitumen at 70, 160 and 220°F. Most observations were at atmospheric pressure or at 200 psia with a few measurements at 8000 psia. It was found that bitumen was precipitated from its solution in tetralin by addition of n-pentane. The separation occurred at lower weight fractions of n-pentane at the lower temperatures. Pressure increased the solubility of bitumen in the tetralin-n-pentane solution. The effect was more pronounced at higher temperatures.

O. T. Bloomer

Billheimer, J. S., Reamer, H. H. and Sage, B. H. MULTIPLE CONDENSED PHASES IN THE DECANE-TETRALIN-BITUMEN SYSTEM. T.P. 2731. *J. Petroleum Technol.* 1, 279-282 (1949) *November.*

The influence of pressure, temperature, and relative quantity of decane on the separation of plastic or solid phases rich in bitumen from the decane-tetralin-bitumen system has been investigated in a restricted range of composition. Measurements were made at atmospheric pressure and at 8000 psia for temperatures of 70, 160, and 220°F. Behavior similar to that of the n-pentane-tetralin-bitumen system was found except that the influence of pressure upon the separation of bitumen was radically different in the decane-tetralin-bitumen system than that found in any of the earlier studies.

Authors' Abstract

Hardey, B. A. TIDELANDS GAS. *Gas* 25, 79, 82 (1949) *December.*

Union Producing Company's first marine gas well is now in operation. A brief story of the prospecting and drilling is presented. The well is located in Lake Raccourci at the northern end of Timbalier Bay and is producing from a depth of about 10,500 ft. The well gaged 17,600 Mcf per day at a rock pressure of 3,940 psi.

J. D. Parent

Kersten, G. V. VARIOUS USES OF OIL-BASE MUD. *Oil Gas J.* 48, 72-74, 87 (1949) *December* 8.

Oil base muds are useful where hydratable, swelling clays are encountered since mud block and loss of permeability are avoided. Also hole size stays close to bit size, and mud does not form heavy deposits. Long clean-up periods are avoided. Oil base muds are, however, costly and they are more disagreeable to handle. It is difficult to avoid settling of weighting agents and contamination by water. Electric logs are more difficult to interpret. A fire hazard exists. Formulae and costs are given.

J. D. Parent

Kimmell, G. O. STAGE SEPARATION. . . . . *Oil Gas J.* 48, 79-80, 88-89 (1949) *December.*

The economics of using more than one separator to resolve a well stream into gas and crude oil or distillate are reviewed. The optimum interstage pressure is closely approximated by using a constant geometric pressure ratio between stages.

O. T. Bloomer

Latchum, J. W., Jr. (assigned to Phillips Petroleum Co.) FRACTIONATING METHANE AND ETHANE FROM HYDROCARBON MIXTURES. U.S. 2,487,147 (1949) November 8.

A process for fractionating dissolved methane and ethane as gas from a volatile hydrocarbon mixture (as for example from a retrograde condensate separator unit) is described. The volatile mixture is passed to a fractionator and the methane and ethane are removed overhead as a gas. The bottoms containing ethane are passed as charge stock into a second fractionator where the ethane is removed overhead and the higher hydrocarbons are removed as the bottoms. The ethane overhead is introduced as a liquid into the first column. Higher pressure operation, lower reboiler temperature operation and simpler equipment are claimed advantages. Refrigeration in the temperature range of -100 to -150°F must be provided to furnish the reflux liquid to the columns.

O. T. Bloomer

McCray, A. W. CHEMISTRY AND CONTROL OF LIME BASE DRILLING MUDS. *Petroleum Engr*, **21B**, 54, 56, 58 (1949) *November*.

Lime base muds will stand considerable contamination, and permit building up of high weights. The manner of usage of this type of mud together with advantages and disadvantages is presented.

J. D. Parent

McMahon, C. J. and Boyd, F. A. FIRST MARYLAND GAS WELL NOW IN PRODUCTION. *Gas Age* **104**, 33, 60 (1949) *December* 22.

Maryland now has a natural gas well producing in commercial quantities. Flow is from about 4500 ft depth at an open flow rate of 432 Mcf per day and a pressure of 1,600 psi. Acidizing increased the open flow fourfold. Cost was $40,000 and an additional amount will be spent for pipe line connection.

J. D. Parent

Muskat, M. and McDowell, J. M. AN ELECTRICAL COMPUTER FOR SOLVING PHASE EQUILIBRIUM PROBLEMS. T.P. 2733. *J. Petroleum Technol.* **1**, 291-298 (1949) *November*.

A special electrical analog computer has been designed to solve the equations relating the composition of the coexisting liquid and vapor phases to the function of the mixture in the gas phase. The equilibrium ratios ($K = y/x$) are used to represent the equilibrium of each component of the system. The use of the computer in solving several typical problems is outlined. Circuit diagrams and a description of the computer are included.

O. T. Bloomer

Sneddon, R. MODERN STATIONS: BLYTHE TO PUMP 405,000,000 CU FT GAS. *Petroleum Engr*. **21D**, 7-10, 12 (1949) *December*.

The Blythe pump station of the biggest inch line is described and a number of photographs are presented.

J. D. Parent

Van Everdingen, A. F. and Hurst, W. THE APPLICATION OF THE LAPLACE TRANSFORMATION TO FLOW PROBLEMS IN RESERVOIRS. T.P. 2732. *J. Petroleum Technol.* **1**, 305-326 (1949) *December*.

The flow of homogeneous fluids through permeable media in the unsteady state is treated. The Laplace transformation is applied to the diffusivity equation rather than to use Fourier-Bessel series. A number of cases are considered and versatility and facility are claimed for the new approach. A useful bibliography is presented. Written discussion is largely concerned with the effect of saturation on the numerical value of the exponent in the resistivity relation.

J. D. Parent

Welch, M. BARNSDALL'S NEWHALL POTRERO GAS AND GASOLINE PLANT. *Calif. Oil World* **42**, 3, 7, 9, 11, 15 (1949) *November second issue*.

Barnsdall's Newhall Potrero gasoline plant has a capacity of 40 MMcf/day of wet gas from oil wells. Absorber pressure is 450 psi and 365 gpm of lean oil is used at design capacity. A plant feature is a rich oil deethanizer using a reabsorption section of 20 trays with 35 to 65 gpm lean oil and is operated at 150 to 200 psi. The stripping section of this unit is operated at 450 psi and contains four heat exchange trays and ten fractionation trays for the oil which is heated to 225° F. About 1½ MMcf/day of methane and ethane are released from this unit which is used to drive process pumps on expansion to fuel pressure. No further deethanizing is necessary and the plant can operate on total condensation. A single lean oil still is used with ten stripping and eight fractionation trays. 2,000 lbs/hr of stripping steam is used. The feed to the still is preheated to 450° F and lean oil leaves at 510° F and provides all process heat. Raw gasoline goes to a depropanizer and a debutanizer. Water treatment includes softening by a Zero-Karb-Na system, aeration, addition of alum, filtration, pH control, algae control with bromine and addition of inhibitors.

J. D. Parent

MAYSVILLE CENTRAL PROCESSING PLANT. *Oil Gas J.* **48**, 91-92, 95-96, 98-100 (1949) *November* 24.

At the central processing plant in Maysville there is a complete oil absorption and natural gasoline processing plant. Rich oil from Lindsay and Antioch each 7½ miles distant is processed here. Products amount to 300,000 gal/day. Excellent pictures of equipment are provided.

J. D. Parent

Purification

Doumani, T. F. (assigned to Union Oil Co. of California) PROCESS FOR THE SEPARATION OF ACID GASES FROM GASEOUS MIXTURES. U.S. 2,486,778 (1949) November 1.

The removal of such gases as SO_2, H_2S, HCN, and CO_2 from a gas stream by countercurrent absorption with complex mixtures of nitrogen bases and/or hydrogenated nitrogen bases and water, alcohols, or aqueous alcoholic solutions is described. The nitrogen bases employed are heterocyclic compounds containing nitrogen in their ring structure. A chemical method is claimed for the separation of the most reactive and easily regenerated nitrogen bases from the crude nitrogen bases obtained from petroleum, coal tar, and bone oil. Procedures are given for the regeneration of spent nitrogen bases and the recovery of absorbed acidic gases.

H. Hakewill

McCullough, O. E., Jr. SWEETENING SMALL VOLUMES OF GAS. *Petroleum Engr.* **21D**, 25-26 (1949) *November.*

The design and operation of a commercially available plant for the economical removal of H_2S from sour gas taken from fields with limited production is described. These units are made in four sizes and are designed for a maximum gas pressure of 725 psig. The plants remove H_2S from natural gas by the essentially continuous circulation of an aqueous solution of an ethanolamine through an absorber and regenerator. A feature of these plants is that the only utility required for operation is a small portion of the processed gas. Gas pressure is employed for transporting amine solution through the system which eliminates the need for a pump; and regeneration of the amine solution is accomplished in a direct fired reboiler operated on process gas. Approximately one barrel of make-up water has to be added each week to replace that lost from the generator. The unit is provided with automatic safety controls so that it runs with infrequent attendance.

H. Hakewill

Meyers, C. O. (assigned to Phillips Petroleum Co.) PROCESS FOR THE REMOVAL OF ACIDIC MATERIAL FROM A GASEOUS MIXTURE. U.S. 2,487,576 (1949) November 8.

The entrainment of the absorption medium used to strip hydrogen sulfide or other acidic materials from gases is prevented by introducing water into the upper part of the absorption column. The rate of introduction of water is from 1 to 5% of the rate of circulation of the absorption medium. The water is removed from the absorbing medium along with the hydrogen sulfide in a stripping column and the absorbing medium is recycled to the absorption column.

O. T. Bloomer

Standby Plant

SAN DIEGO INSTALLS LARGE STANDBY PLANT. *Gas Age* **104**, 19-20, 59 (1949) *December* 22.

36 tanks holding one million gallons of propane and costing $1,500,000 have been installed solely as standby facilities in case of line failure. In addition to the old pipe line delivering 33 MMcf/day a new one connecting to the biggest inch and capable of delivering 40 MMcf/day has just been completed.

J. D. Parent

Vaporization Equilibria

Scott, R. C. J. EQUILIBRIUM VAPORIZATION CONSTANTS FOR NATURAL GAS HYDROCARBONS AND HYDROGEN. *Chem. Ind.* **65**, 956, 958 (1949) *December.*

A nomograph for evaluating the vaporization equilibrium ratios of methane and ethane is

presented. It is based on the work of Brown and Stutzman.

J. D. Parent

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Helm, R. V., Haines, W. E. and Ball, J. S. SULFUR IN PETROLEUM . . . p. 13

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Corrosion

Kartinen, E. O. CORROSION MITIGATION WITHIN DEHYDRATING TANKS. *Oil Gas J.* 48, 82, 84 (1949) *December* 8.

A cathodic protection system was installed in the lower zone of dehydrating tanks. Satisfactory results have been obtained using galvanic anodes in the studies in the water or brine layer.

B. E. Hunt

Rogers, W. F. INFLUENCE OF OIL IN SUBSURFACE CORROSION. *Oil Gas J.* 48, 73-75, 79, (1949) *December* 15.

A study has been made on the ability of produced oils to wet steel in the presence of the produced water and the effect of this ability on the subsurface corrosion. A method was developed for determining the presence of an oil film in an effort to correlate the oil drop-size ratio, the presence of the oil film and the corrosion history of the subsurface equipment. Since commercial wetting agents are at present used to develop oil films on steel surfaces a study was made of the drop size ratio and wetting ability of various proportions of produced oil and produced water which had been treated with wetting agents.

B. E. Hunt

Exploration

Deegan, C. J. HELICOPTERS NOW ROUTINE IN OIL EXPLORATION. *Oil Gas J.* 48, 79, 81 (1949) *December* 8.

Helicopters are now in routine use in oil exploration. A wide variety of uses such as assisting in laying cable; planting geophones; moving equipment, observers and shooting crews is reported.

J. D. Parent

Fischer-Tropsch Synthesis

Friedman, A. H. and Moran, J. N. (assigned to Phillips Petroleum Co.) FELDSPAR-IRON-ALKALI FISCHER-TROPSCH CATALYST AND ITS PREPARATION. U.S. 2,488,530 (1949) November 22.

An iron catalyst suited for use in the hydrogenation of carbon monoxide to form hydrocarbons is prepared by fusing iron oxide with a mixed silicate of aluminum and a metal selected from the alkali or alkaline earth metals, followed by reduction. As a particular example, iron oxide fused with an equal weight of feldspar was reduced and used as a synthesis catalyst.

C. H. Riesz

Sulfur

Helm, R. V., Haines, W. E. and Ball, J. S. SULFUR IN PETROLEUM. III. SELECTED PHYSICAL PROPERTIES OF SOME SULFUR COMPOUNDS. U.S. Bureau of Mines Report of Investigations 4566 (1949) November.

This is the second of a series of compilations listing values for the various physical properties of sulfur compounds believed to be most likely to occur in petroleum and petroleum products. To bring the first compilation up to date, revised and additional data are given for boiling points, refractive indices, densities, and freezing points. New data given include refractive indices for the F, C, and G′ lines of hydrogen and the D_3 line of helium, surface tensions, viscosities, refractivity intercepts, specific dispersions, specific refractions, and parachors. The sulfur compounds considered are thiols, sulfides, disulfides, and thiophenes; and recommendations for consistent nomenclature of these compounds are presented.

H. Hakewill

Synthesis Gas

Gorin, M. H. and Abrams, A. J. (assigned to Socony-Vacuum Oil Co., Inc.) PRODUCTION OF SYNTHESIS GAS. U.S. 2,485,875 (1949) October 25.

A process is described for converting natural gas into carbon monoxide and hydrocarbon by reaction with carbon dioxide and steam. The method involves circulation of molten lead or tin as a liquid heat transfer agent which contacts the reactants in a tower packed with refractory, preferably lime.

C. H. Riesz

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Walker, R. and Applebee, H. C. UTILIZATION OF REFINERY GAS. p. 7

7. ANALYTICAL METHODS AND TESTS

Calorimeter

Schuller, P. APPARATUS FOR CONTINUOUS MEASUREMENT OF THE CALORIFIC VALUE OF FLUIDS. *Engrs' Digest* **10**, 383 (1949) *November.*

A patented apparatus for measuring and automatically controlling the heating value input of a continuous supply of liquid or gaseous fuel is described. Measurement and control are accomplished by a water flow calorimeter connected in parallel with the main fuel line. The calorimeter is operated on a constant quantity of water flow and is supplied an excess of compressed air to support combustion of the fuel. The flow rates of air and fuel entering the calorimeter are regulated by fixed orifices having the upstream pressures of both balanced against the upstream pressure in the main fuel line. In this manner the difference in water temperatures as read from the calorimeter thermometers is directly proportional to the heating value content of the main fuel stream. It is claimed that the apparatus can be used satisfactorily on fuel lines having pulsating flow, variations in composition and specific gravity, and sudden variations in flow; and that it has been employed for gas flow having a widely varying calorific value. It is further claimed that measurements are very rapid, that variations of calorific value are registered in less than 30 seconds, and that results obtained with the apparatus are subject to a maximum error of less than 5%.

H. Hakewill

Carbon

Farrington, P. S., Niemann, C. and Swift, E. H. DETERMINATION OF CARBON BY WET COMBUSTION. *Anal. Chem.* **21**, 1423-1424 (1949) *November.*

A method is described for the determination of carbon in organic solids and relatively nonvolatile liquids by means of digestion with a heated mixture of fuming sulfuric acid, concentrated phosphoric acid, chromium trioxide, and potassium iodate in a stream of CO_2-free air; the CO_2 evolved from oxidation of the sample is absorbed in sodium hydroxide solution, and the carbonate formed is precipitated as barium carbonate, which is determined acidimetrically. Determinations of the carbon content of several pure organic compounds are presented to demonstrate an accuracy of ± 0.05 mg for the method when analyzing 10 to 12 mg samples. Further advantages claimed for the method are: inexpensive equipment is required, little space is needed for the equipment, a determination requires about 45 minutes, and halogens, nitrogen, and sulfur do not cause interference.

H. Hakewill

Gas Analysis

Galstaun, L. S. and Thomas, D. D. GAS ANALYSIS APPARATUS. U.S. 2,488,812 (1949) November 22.

A method relating to the governing of the flow of fluids and particularly to means for automatically and recurrently reversing the flow of fluids in a closed system is described. It is claimed that this invention may be adapted to Toepler pumps, Orsat analyzers and similar laboratory equipment for the purpose of eliminating manual operation. Examples of the manner in which an Orsat analyzer and a Toepler

pump may be operated, employing the principles of control outlined in the invention, are given in detail.

H. Hakewill

8. GENERAL AND PHYSICAL CHEMISTRY

Thermodynamic Properties

Claitor, L. C. and Crawford, D. B. THERMODYNAMIC PROPERTIES OF OXYGEN, NITROGEN, AND AIR AT LOW TEMPERATURES. *Trans. Am. Soc. Mech. Engrs.* 71, 885-895 (1949) *November.*

Thermodynamic properties of oxygen, nitrogen, and air calculated from a new equation of state based on correlations of literature data on specific volumes, Joule-Thomson coefficients, and acoustic velocities and other information on heat capacity and latent heat of vaporization. The calculations are available in the form of temperature-entropy diagrams and specific heat charts covering the ranges 80 to -320°F and 0 to 180 psia, and were designed primarily for use in engineering calculations of modern low pressure tonnage oxygen plants.

C. Von Fredersdorff

Goff, J. A. STANDARDIZATION OF THERMODYNAMIC PROPERTIES OF MOIST AIR. *Heating, Piping, Air Conditioning* 21, 118-128 (1949) *November.*

A recommendation of the formulation of the thermodynamic properties of moist air at low pressures using development in statistical mechanics as a tool is presented. This method takes into consideration intermolecular forces of both like and unlike species, something which Dalton's Law does not consider, and which can be obtained from spectroscopic data. Also included are discussions on dry air composition, molecular weights, zero pressure properties, physical constants, conversion factors and reference points for enthalpy and entropy from data obtained from reliable sources.

S. Mori

Hirschfelder, J. O., Bird, R. B. and Spotz, E. L. VISCOSITY AND OTHER PHYSICAL PROPERTIES OF GASES AND GAS MIXTURES. *Trans. Am. Soc. Mech. Engrs.* 71, 921-937 (1949) *November.*

Molecular theory is used in this paper to formulate thermodynamic properties of gases and gas mixtures at moderate pressures. These include the second virial coefficient and the Joule-Thomson coefficient. The kinetic theory is used to derive expressions for viscosity, thermal conductivity and diffusion of pure gases and mixtures. In many cases the theory predicts values in excellent agreement with experiment over a wide temperature range. Cases where agreement is less satisfactory are discussed qualitatively.

S. Katz

Klein, V. A. LATENT HEATS OF VAPORIZATION. *Chem. Eng. Progress* 45, 675-676 (1949) *November.*

A simplified variant of the Clausius-Clapeyron equation is proposed which permits the calculation of latent heats of vaporization from a single vapor pressure measurement and a knowledge of the initial pressure and temperature.

S. Katz

Thermodynamics

Edmister, W. C. APPLICATION OF THERMODYNAMICS TO HYDROCARBON PROCESSING. PART XXIV—EFFECT OF PRESSURE ON PHASE RELATIONSHIP FOR PETROLEUM FRACTIONS. *Petroleum Refiner* 28, 149-155 (1949) *November.*

The extension of the equilibrium flash vaporization curves to elevated pressures is described and empirical methods of constructing the phase diagram of petroleum fractions with the use of the critical and focal points are described.

S. Katz

Kobe, K. A. and Long, E. G. THERMOCHEMISTRY FOR THE PETROCHEMICAL INDUSTRY. PART VII. THE COMBUSTION GASES. *Petroleum Refiner* 28, 127-132 (1949) *November.*

The eighth in the series of articles involving

the thermodynamic properties of different groups is concerned with the combustion product gases. They include carbon dioxide, carbon monoxide, hydrogen, oxygen, nitrogen, air, and water vapor. As previously, tables giving the reliable reference sources from which the heat capacity data was obtained, as well as tables giving free energy and heats of formation, heats of combustion, heat capacities and enthalpies in four different temperature scales from 0 to 3500° C or their equivalence on the other scales, and the coefficients for the heat capacity equation given as a function of temperatures are presented. The reference point or zero enthalpy is taken at zero centigrade or its equivalence for the enthalpy tables.

S. Mori

10. CHEMICAL ENGINEERING

Fluidization

Hancock, R. T. THE PHYSICAL BASIS OF FLUIDIZATION. *Coke & Gas* (British) **11**, 386-388 (1949) *November.*

An equation is presented relating the particle diameter, voidage, velocity, particle density, and fluid density. The equation is developed for spherical particles, but in order for it to apply to powdered materials, experimental correction factors must be determined.

W. J. Merwin

Gas Absorption

Koch, H. A., Jr., Stutzman, L. F., Blum, H. A. and Hutchings, L. E. GAS ABSORPTION. *Chem. Eng. Progress* **45**, 677-682 (1949) *November.*

A study was made of the rate of mass transfer of carbon dioxide from air to water, using $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{3}{4}$ in., and $1\frac{1}{4}$ in. Raschig rings in 6 in. and 10 in. towers packed to heights of four ft. Both tap water and distilled water were used, and equilibrium data were determined for each system. Overall K_1a values for all packings were found to be best correlated by a line on a log-log plot of K_1a vs. liquid mass velocity with a slope of 0.96. Gas phase resistance was found to be negligible, so the derived correlation represents the liquid film coefficient: $k_1a = 0.25\ L^{0.96}$. 0.8 is the most widely accepted exponent for L, but 0.96 represented the best compromise between avera, · deviation of the data and representation at both extremes of liquid rate.

C. L. Tsaros

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Sherwood, P. W. TONNAGE OXYGEN TODAY. p. 7

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Cost Estimate

Van Noy, C. W., Dunville, T. C., Dressler, R. G. and Chaffee, C. C. GUIDE FOR MAKING COST ESTIMATE FOR CHEMICAL-TYPE OPERATIONS. U.S. Bureau of Mines Report of Investigations 4534 (1949) November.

Tabular forms are presented for the purpose of estimating the cost of chemical-type operations. The costs are classified into direct, indirect, fixed, and miscellaneous. Each of these topics is discussed and figures are given for estimating their value. A table of depreciation rates is presented.

W. J. Merwin

Review

TECHNOLOGY AND EQUIPMENT HEAD FOR HIGHER PROCESS EFFICIENCY. *Chem. Eng.* **56**, 103-109 (1949) *November.*

A general review of current trends in chemical engineering technology is presented. The items discussed include: materials handling; fluids handling; process energy; disintegration; mixing; high pressure; fluidization; physical separations; mechanical separations; and instruments and process control.

W. J. Merwin

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